



ELECTRO OPTICS

Target Acquisition Systems and Tactics

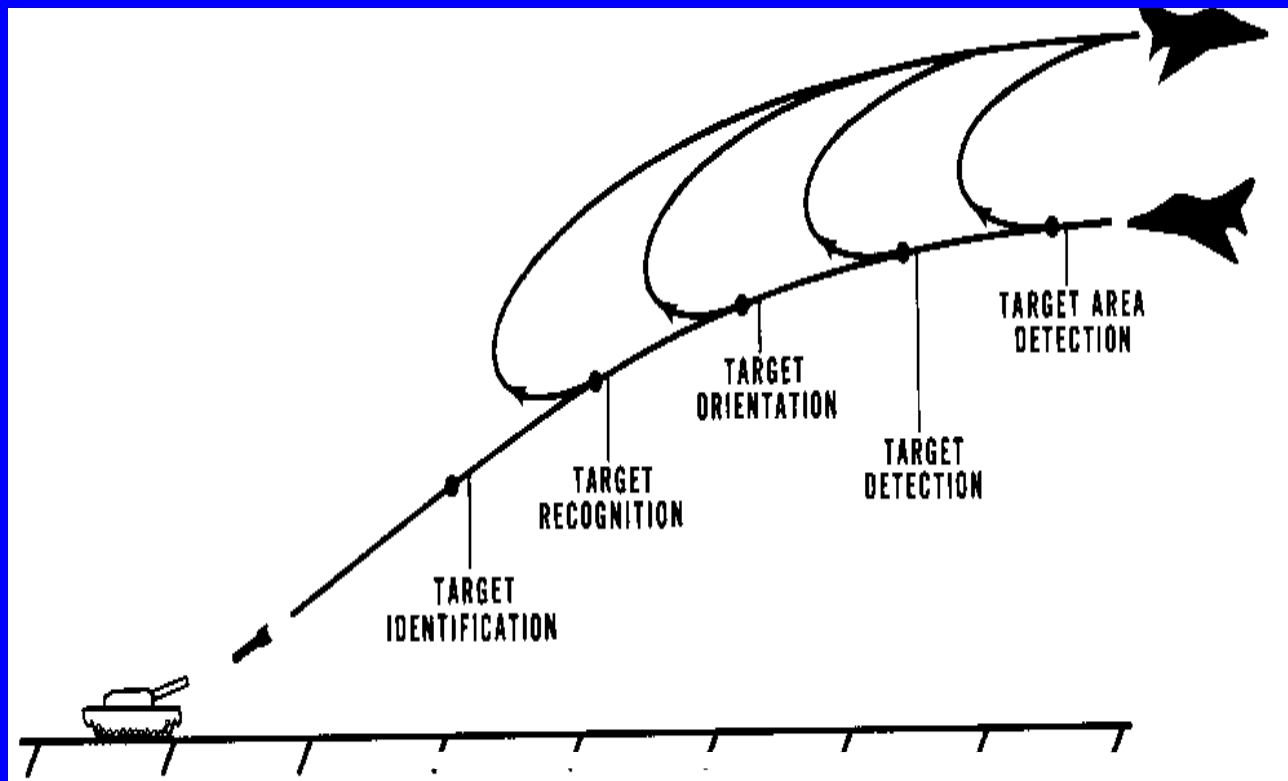
Principles of Precision Guided Munitions



Target Acquisition Cycle



- Five step process used by aircrews to acquire and destroy targets
 - Target Area Detection
 - Target Detection
 - Target Orientation
 - Target Recognition
 - Target Identification



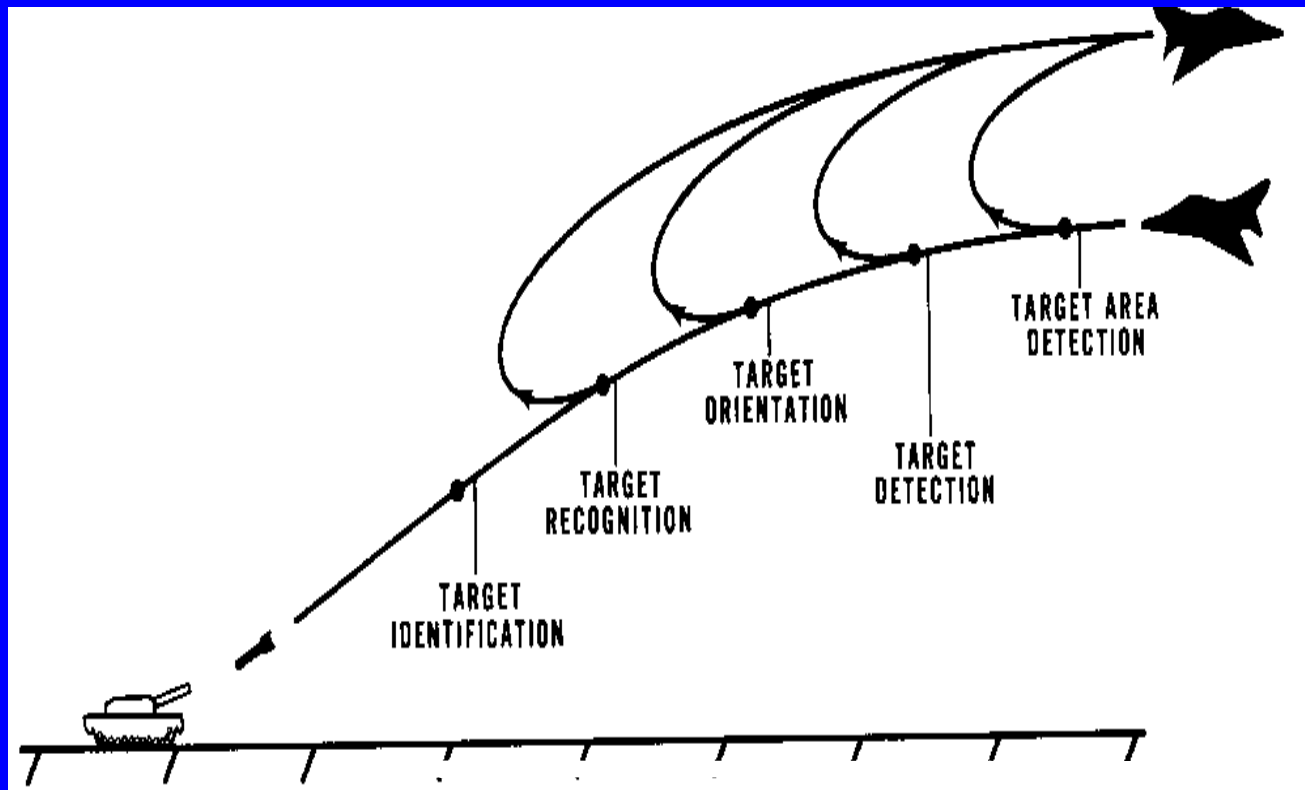
TARGET AREA DETECTION



Target Area Detection



- Many resources available to assist the aircrew with this initial phase
 - Intelligence (Photographs)
 - Forward Air Controller (ground or airborne)
 - Airborne Command and Control (EC-130)
 - JSTARS (E-8C)
 - AWACS (E-3)



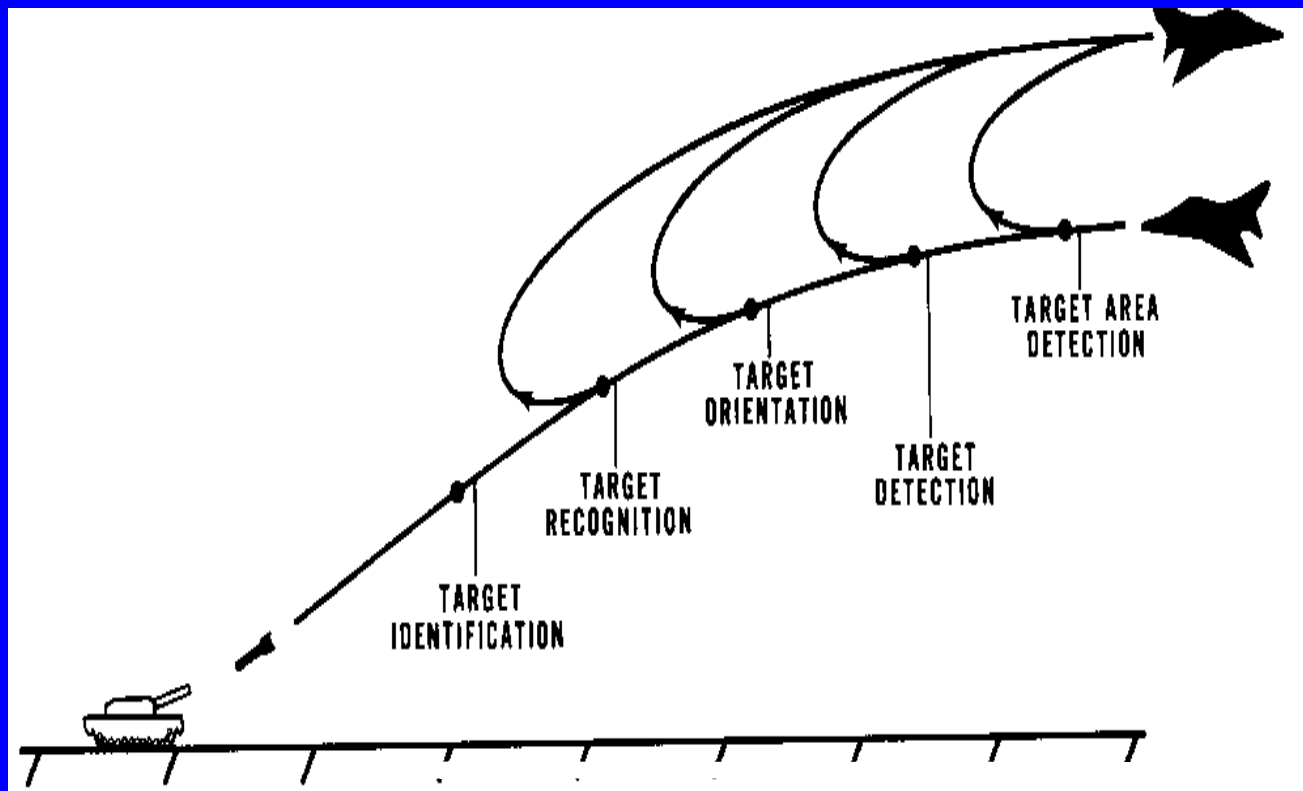
TARGET DETECTION



Target Detection



- Aircrew must find a target within the area
 - target-to-background contrast
 - provided by the weather forecaster via EOTDA
 - target size relative to target area
 - mobile or stationary target
 - a moving target is much easier to identify
 - system limits (task saturation/sensor sensitivity)
 - existing weather conditions



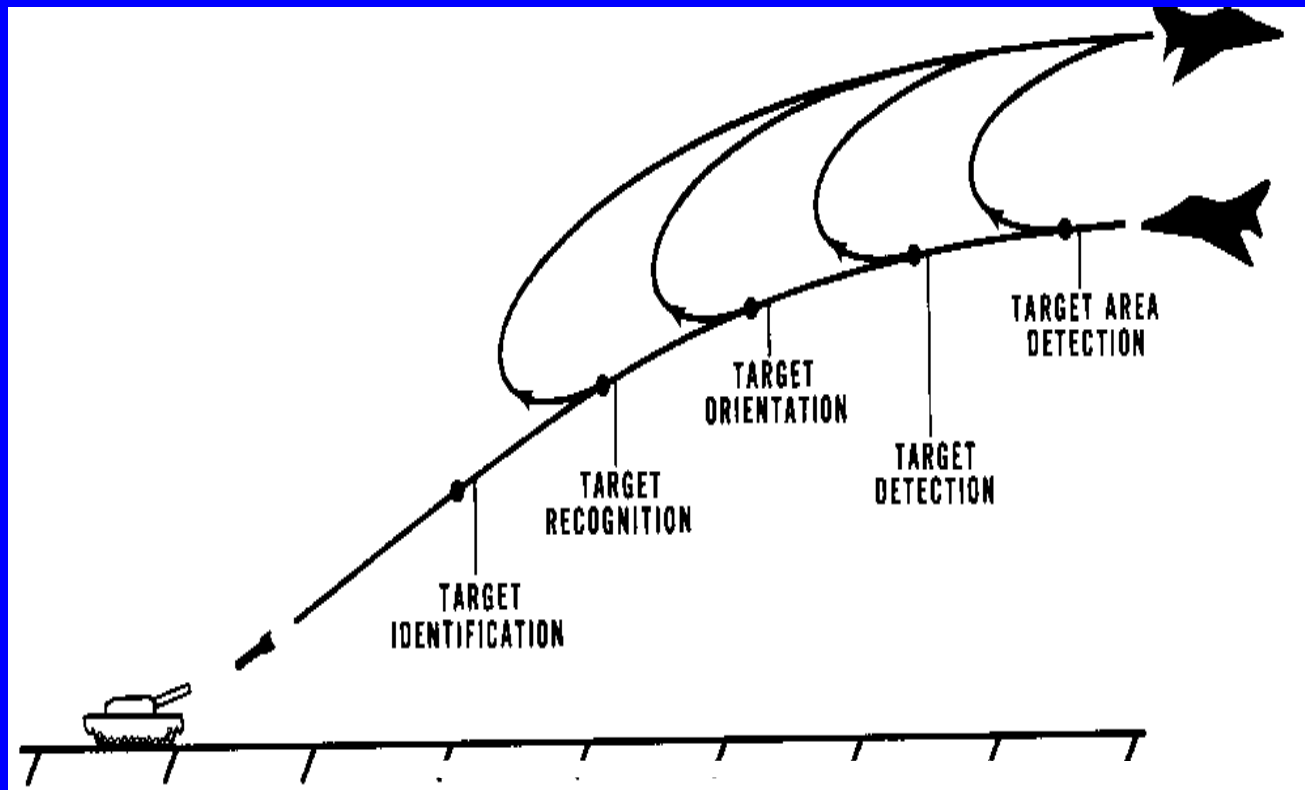
TARGET ORIENTATION



Target Orientation



- The aircrew must determine the front and back of the target
 - fixed and high value targets usually have recognizable features
 - vehicles change orientation frequently and are difficult to establish if stationary
 - movement of vehicles will, most times, reveal their orientation



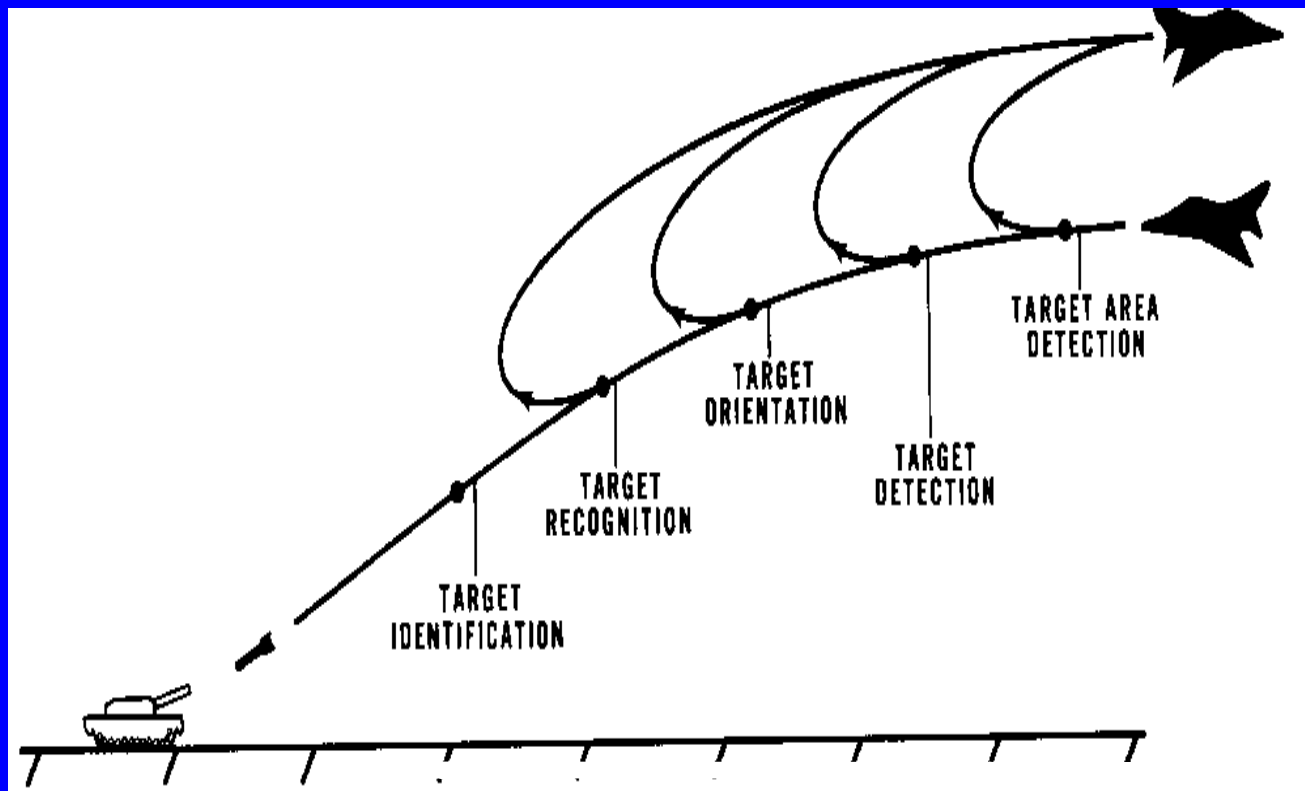
TARGET RECOGNITION



Target Recognition



- The aircrew must classify the target
- At this point the pilot will be able to identify the target as an aircraft shelter instead of simply a building
- At this point the pilot will be able to identify the target as a tank instead of simply a vehicle



TARGET IDENTIFICATION



Target Identification



- Pilot must determine the specific target
- This final step is essential to determine if the target is friend or foe
 - an M-1 or a T-80



Air-to-Ground Mission



- Close Air Support (CAS)
- Air Interdiction (AI)
- Suppression of Enemy Air Defenses (SEAD)
- Offensive Counter Air (OCA)



Launch Envelope



- The range of altitudes and distances within which a weapon can be used effectively without exposing the aircrew to enemy air defense
- The aircrew must get close enough to detect and lock-on to the target without entering the range of enemy defenses
 - adverse weather can limit the size of the launch envelope and limit the use of the weapon



TAS Design



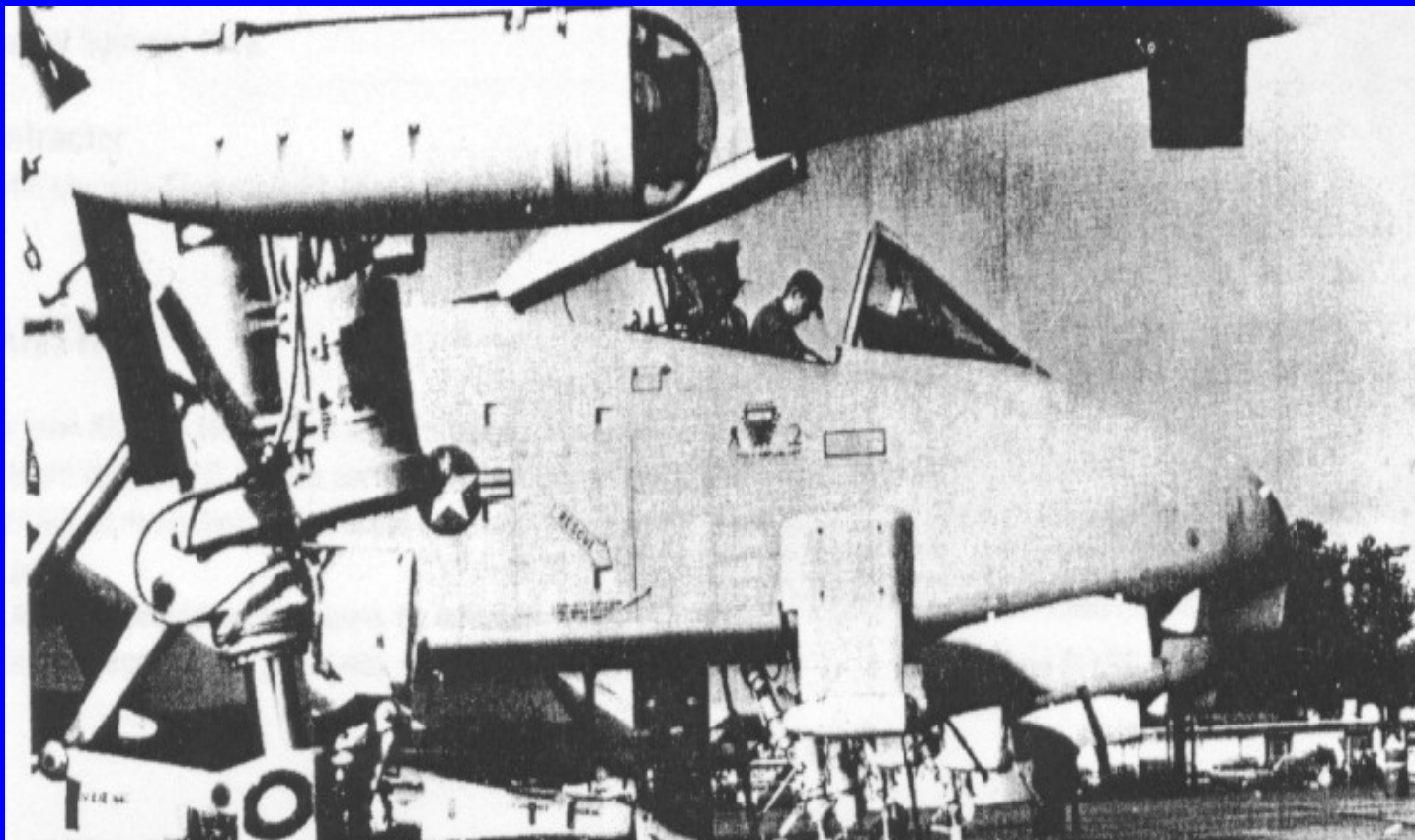
- Components of Target Acquisition Systems
 - Visual and/or IR
 - FLIR (WFOV/NFOV)
 - DLIR (WFOV/NFOV)
 - Laser Designator/Range Finder
 - HUD
 - HDD



TAS



- Pave Penny (laser-based target ID set)
 - detects laser energy from remote designators
- Lantirn (navigation pod and targeting pod)
 - penetrate at low altitude and high speed, acquire target, and deliver weapon day or night
 - Low Altitude Navigation and Targeting Infrared for Night
 - employs laser designator
 - can track multiple targets



PAVE PENNEY



This Lockheed F-16 carries both navigation and targeting pods of the Martin Marietta LANTIRN system under its fuselage



The F-15E Eagle with LANTIRN navigation and targeting pods

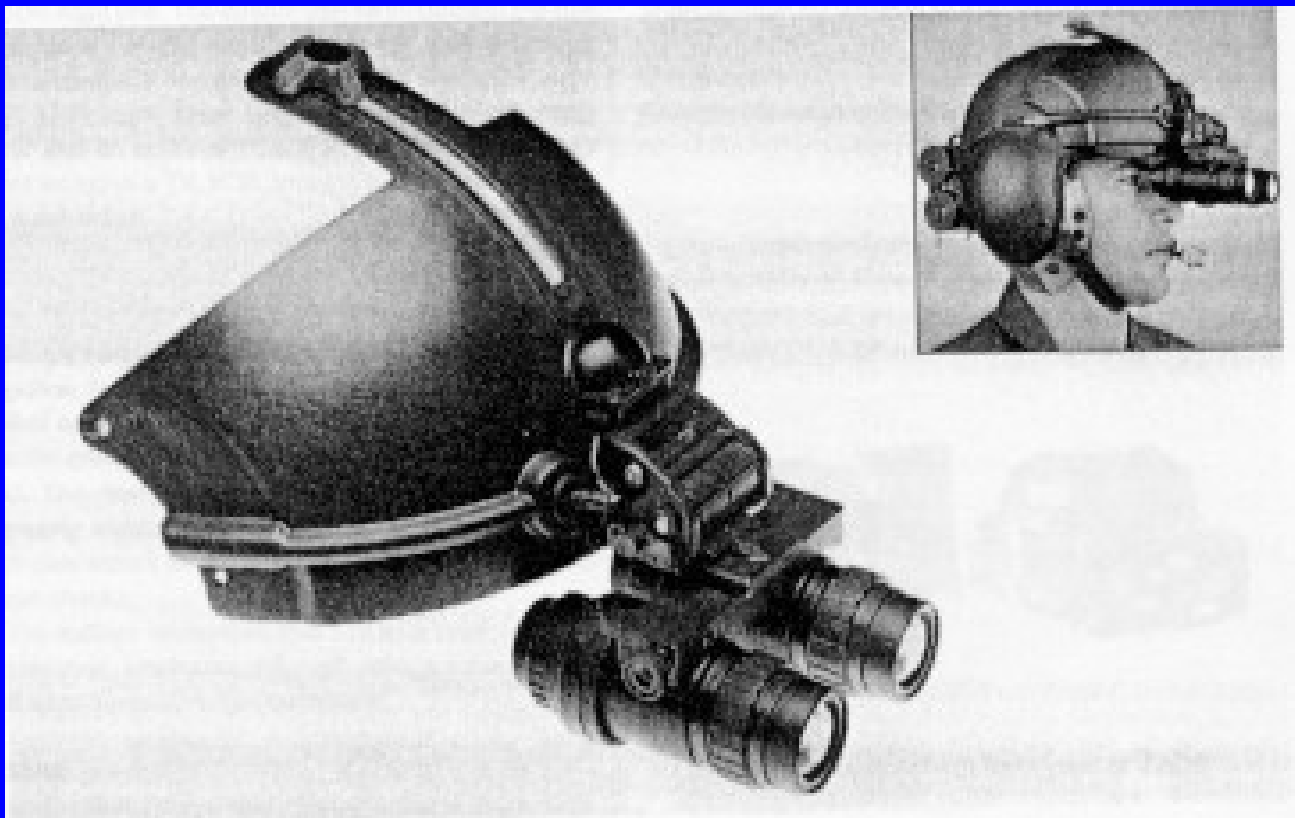
LANTIRN



Night Vision Goggles



- Employed by all branches of the DoD and are not specific to any one aircraft
- Light-amplifying television camera sensitive to near-IR and visible wavelengths



**NIGHT VISION
GOGGLES**



Precision Guided Munitions



- Three types of Precision Guided Munitions
 - Active
 - Passive
 - Semi-Active



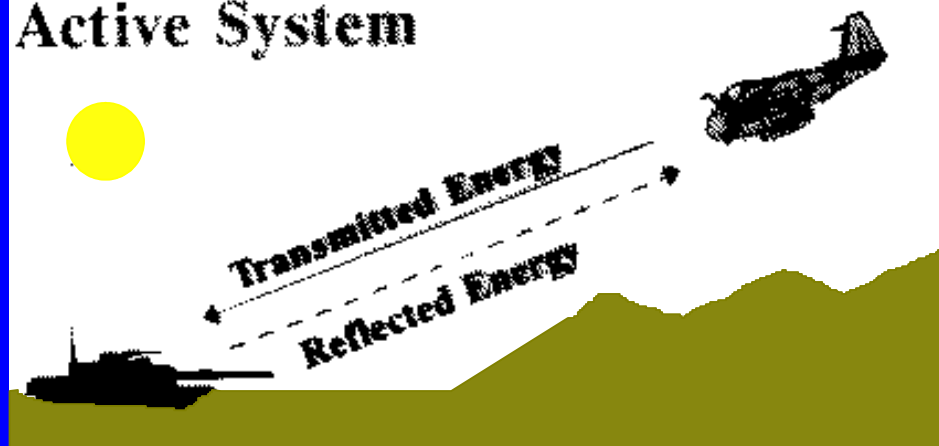
Active



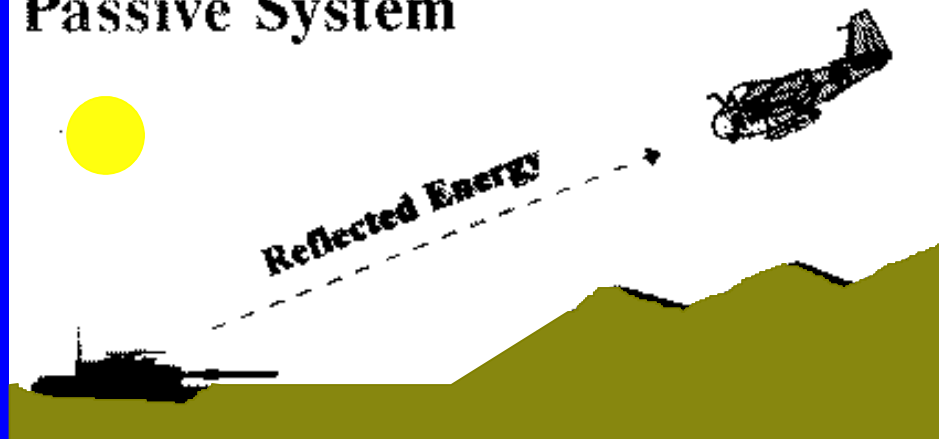
- Provides energy for target illumination and detects this energy for target identification
 - has a designator and detector in the same unit
 - generally associated with RADAR systems
 - AMRAAM missile
 - very costly; used only against high value targets
 - ships, communication facility



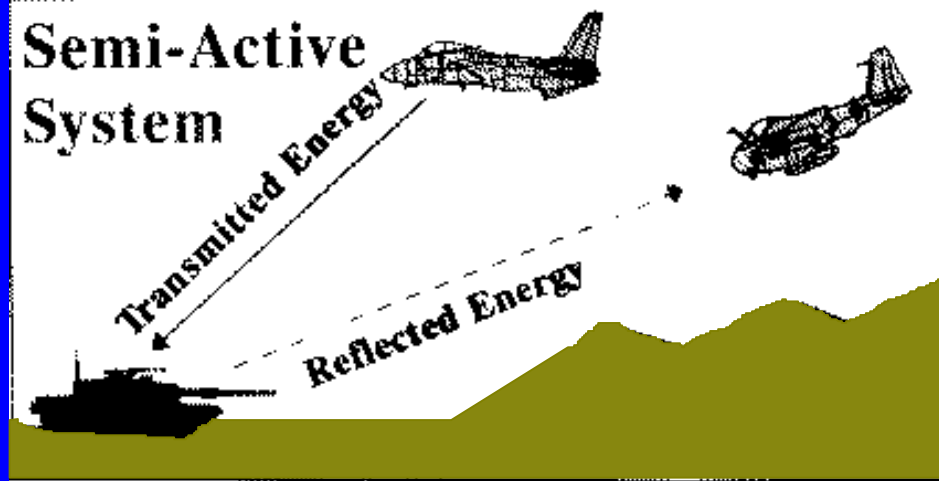
Active System



Passive System



Semi-Active System





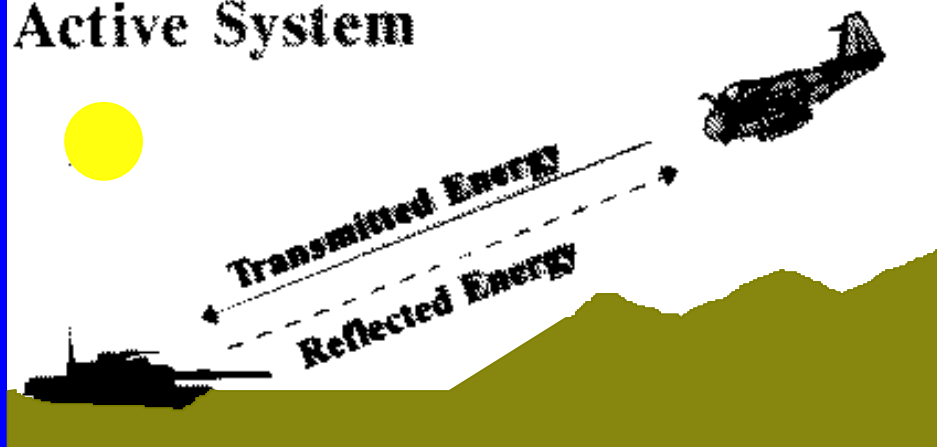
Passive



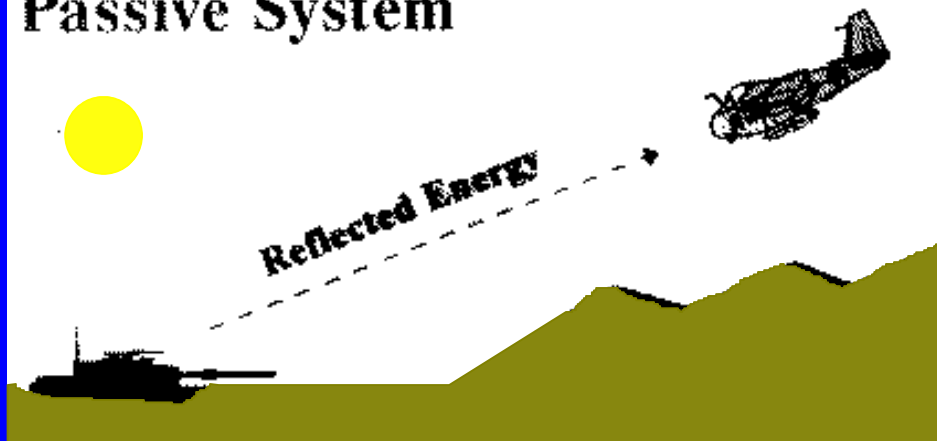
- Detects energy that originates from the target itself
 - TV guided bomb or missile
 - detects reflected sunlight (TV maverick missile)
 - IR guided bomb or missile
 - detects thermal energy emitted by the target
 - AIM-9 Sidewinder, IR maverick missile
 - Radar guided bomb or missile
 - HARM AGM-88 detects emitted radar energy



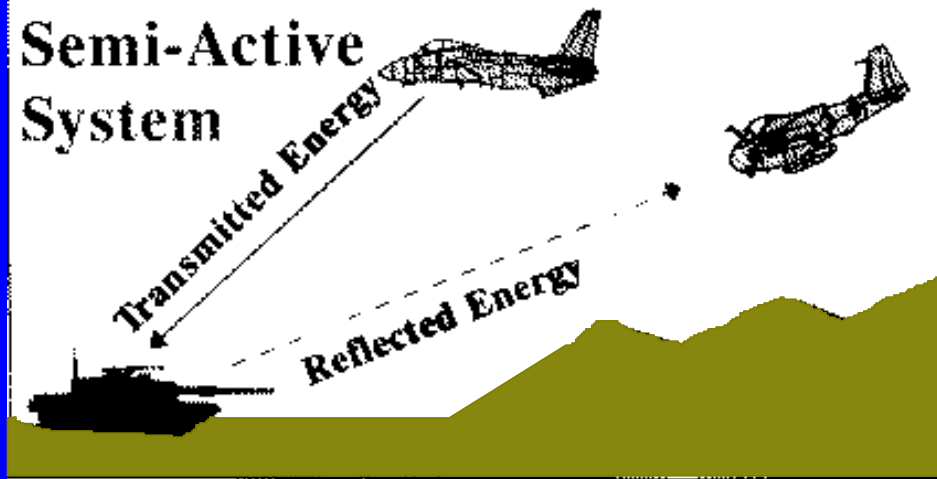
Active System



Passive System



Semi-Active System





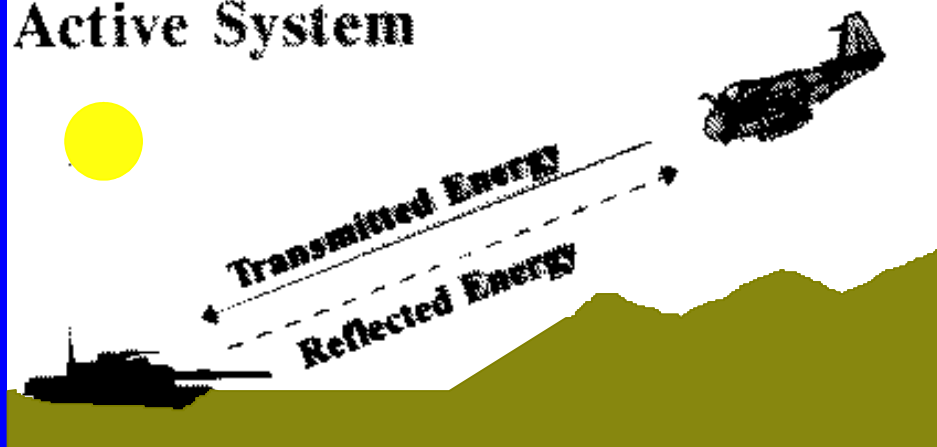
Semi-Active



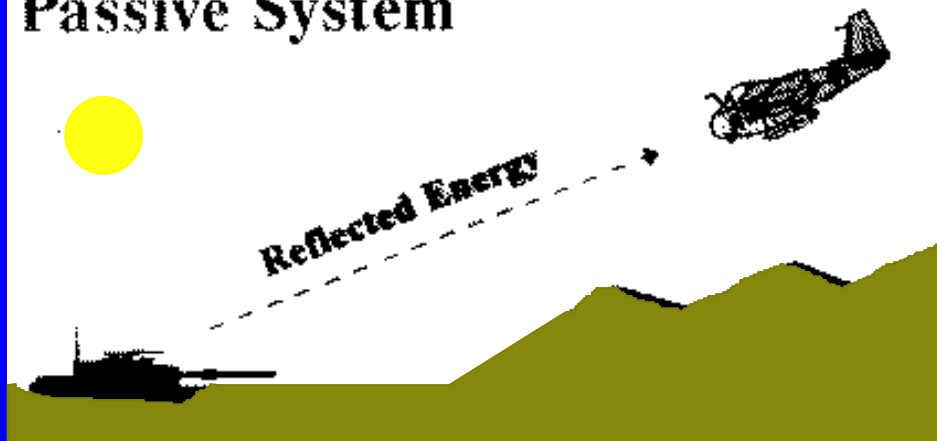
- Detects reflected energy provided by a laser designator not located on the munition
 - ground based or airborne based designator
 - designator can be on the same aircraft or another aircraft or on the ground
 - GBU Glide Bomb utilizes this property



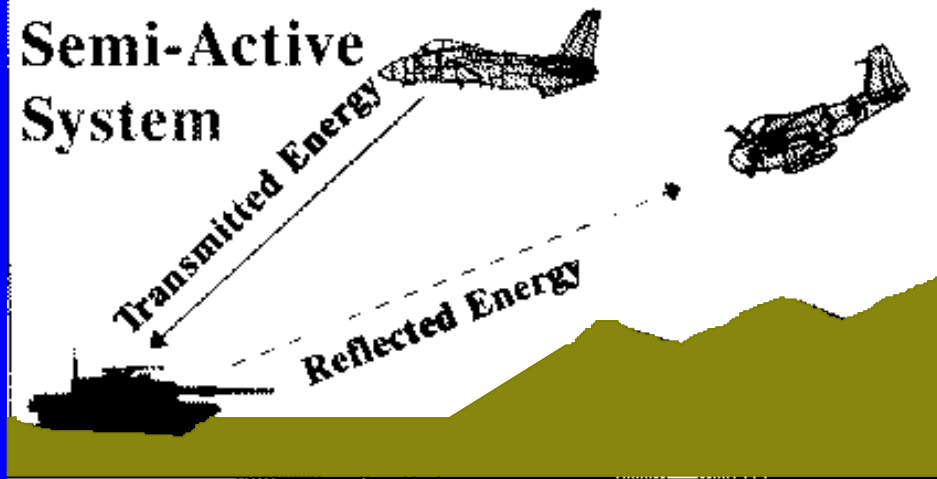
Active System

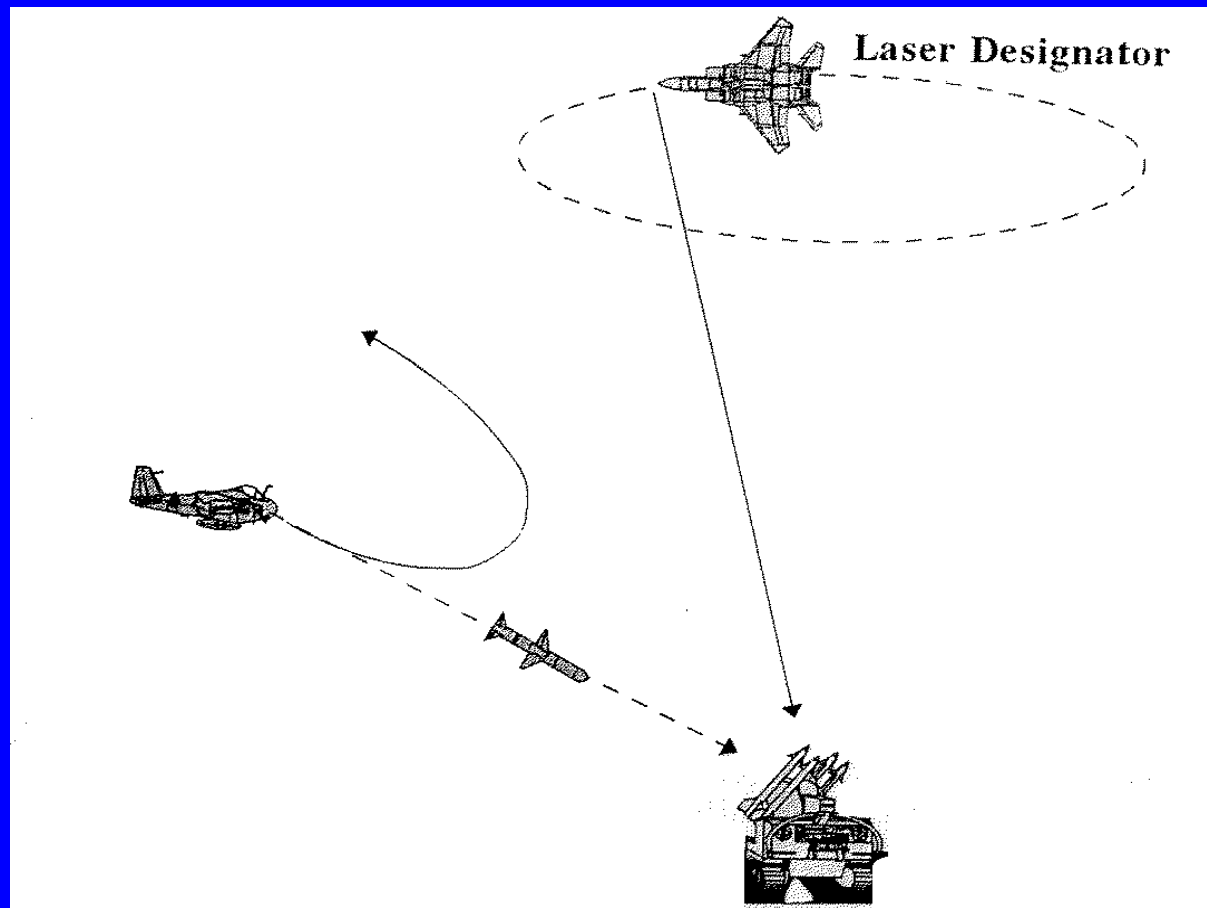


Passive System

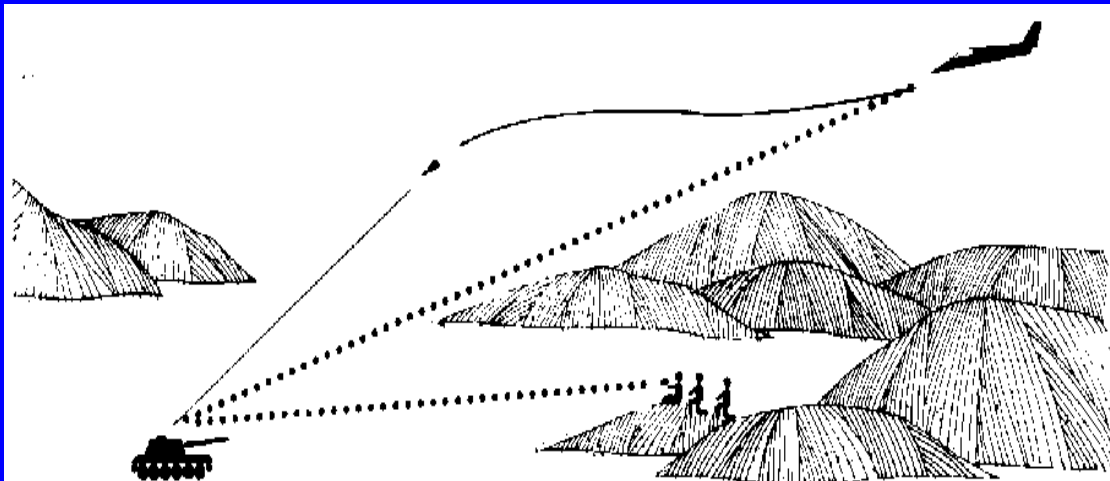


Semi-Active System





**SEMI-
ACTIVE**



LASER DESIGNATOR





Employment Modes



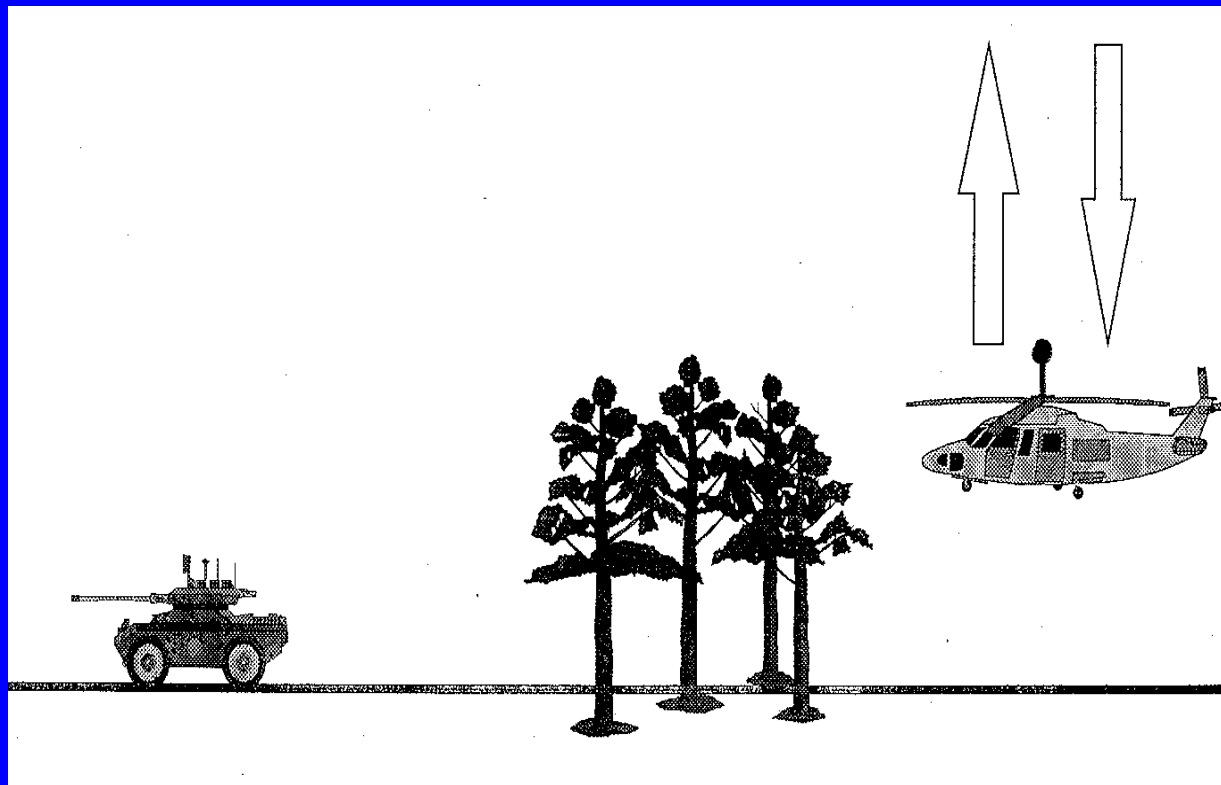
- Determined by the sequence in which the weapon is launched, locks-on to target, and aircraft leaves target area
 - LO/LA/LV: lock-on/launch/leave
 - can be used with any system by must be used with system that do not have a data link to the munition
 - LA/LO/LV: launch/lock-on/leave
 - used with passive systems equipped with a data link
 - LA/LV/LO: launch/leave/lock-on
 - used with active, passive, or semi-active
 - used with laser-guided munitions remotely lased
 - “fire and forget”



Employment Tactics



- Laydown
- High Angle Dive Bombing
- Shallow Angle Dive Bombing
- Toss and Loft
- Sneak and Peak



SNEAK AND PEAK